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REMOVAL OF SULFUR-CONTAINING GASEOUS COMPOUNDS
FROM THE STACK GASES OF SODA RECOVERY BOILERS

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V. B. Lesokhin, V. F. Maksimov

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ot serosoderzhashchikh gazoobraznykh soyedineniy

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REMOVAL OF SULFUR-CONTAINING GASEOUS COMPOUNDS
FROM THE STACK GASES OF SODA RECOVERY BOILERS

The stack gases from soda recovery boilers (SRB) are one of the principal sources of emissions of sulfur dioxide, hydrogen sulfide, and methanethiol.

Lacking at present in the generally accepted removal of dust carry-over with the stack gases from SRB in electrostatic precipitators is the additional removal of gaseous pollutants. The concentrations of sulfur dioxide, hydrogen sulfide, and methanethiol in the atmosphere at ground level were calculated (using P. I. Andreyev's formula) for soda recovery in a typical pulp plant with a capacity of 1,000 tons of pulp per day. The calculations showed that the sanitary standards with respect to these impurities cannot be met in the majority of cases.

Failure to meet sanitary standards (TLV) for atmospheric air has become one of the chief obstacles to the building of big sulfate plants.

Efforts to solve the problem of removing sulfur-containing components from the stack gases from SRB are afoot in foreign countries, but from all reports the level of rendering harmless the hydrogen sulfide and the methanethiol is low, and is between 20 and 60 percent.

The Labor Protection Department of the Pulp and Paper Industry developed an installation that uses a weak alkaline solution to remove gases that contain sulfur from the stack gases of SRB.

The installation consists of two jet stages, heat exchangers, pumps, and auxiliaries.

A weak alkaline solution, which is the intermediate product of the liquor recovery cycle, so-called weak white liquor, is pumped through a heat exchanger at a pressure of 7 atm. to spray the second stage.

The liquor flows into a tank from the second stage drop separator, and from there circulates through the first stage, the circuit of which is pump-heat exchanger-jet (pipe-mixer-drop separator)-tank. Some of the circulating weak white liquor is bled off for production purposes. Any lack of fresh weak white liquor in the second stage is made up by a small quantity of circulating liquor.

Scrubbing the stack gases from SRB with an alkaline solution results in the chemisorption of acid components in gaseous form, including, in addition to those gases that contain sulfur, carbon dioxide, which makes up 12 to 17 percent of stack gases.

The absorption of carbon dioxide inhibits, and can completely prevent, the absorption of the hydrogen sulfide and the methanethiol, components that are most in need of being rendered harmless because of their low TLV.

Effective absorption of hydrogen sulfide and methanethiol under stack gas sorption conditions obviously takes place because of their selective absorption based on the difference in the chemisorption rates for these gases. The absorption rate for carbon dioxide is lower than that for hydrogen sulfide and methanethiol by 2-3 orders of magnitude.

The use of a jet for chemisorption increases this difference in rates because of the acceleration of absorption in the gas phase, which appears only in the form of an increase in the hydrogen sulfide and methanethiol absorption rates.

Limiting the phase contact time, the result of using short mixer tubes in the proposed equipment, 1.6 m instead of the usual 8-10 m long ones, increases the absorption of the hydrogen sulfide and the methanethiol to 80%, and that of the sulfur dioxide to 85%, with minimum side absorption of carbon dioxide.

The study results became the basis for assigning the specifications for equipment to clean up stack gases from SRB to the Planning Institute of the State Institute for the Planning of Establishments of the Pulp, Paper, and Hydrolysis Industries. The engineering problems in connection with the blueprints for an installation for cleaning SRB stack gases at the Syktyvkar Timber Industry Complex were cleared up at the beginning of 1969, and the plans were reviewed and approved by the Ministry.